

Amendments to the claims

Claims 1-22 (canceled)

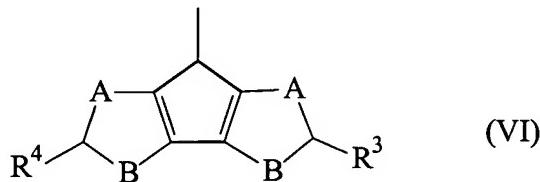
Claim 23 (currently amended) A process for the preparation of a ligand of formula (V):



wherein

R¹ and R², the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; optionally R¹ and R² form a ring comprising from 3 to 8 atoms, which can bear substituents;

Q' is a moiety of the general formula (VI):



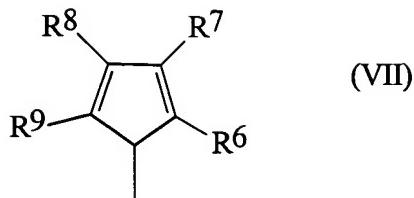
and or its double bond isomers,

~~wherein A, B, R³ and R⁴ are defined as described as in claim 1;~~

wherein A and B are selected from sulfur (S), oxygen (O) or CR⁵, R⁵ being selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; either A or B being different from CR⁵, and wherein the rings containing A and B have a double bond in the allowed position having an aromatic character; if A is S or O, B is CR⁵ or if B is S or O, A is CR⁵;

R³ and R⁴, the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

L' is a moiety of the general formula (VII):

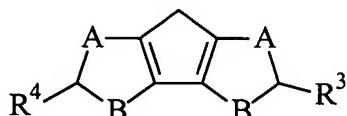


and or its double bond isomers,

wherein R¹, R², R⁶, R⁷, R⁸ and R⁹ are defined as described as in claim 1, R⁶, R⁷, R⁸ and R⁹, the same or different from each other, are selected from C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; and at least two adjacent R⁶ and R⁷ or R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents and optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

comprising the following steps:

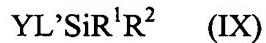
- i) treating the a compound of formula (VIII) with at least one equivalent of a base selected from the group consisting of metallic sodium and potassium, sodium and potassium hydroxide and an organolithium compound;



(VIII)

wherein the rings containing A and B have a double bond in the allowed position having an aromatic character; A, B, R³ and R⁴ are defined as above;

- ii) contacting the corresponding anionic compound obtained under from step i) with a compound of general formula (IX):



wherein L', R¹, R² have the meaning described as in claim 1 above and Y is a halogen atom selected from the group consisting of fluoride, chloride, bromide and iodide[;].

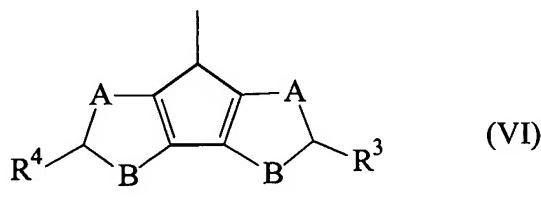
Claim 24 (currently amended) A process for the preparation of a ligand of formula (V): as defined in claim 23

SiR¹R²Q'L' (V)

wherein

R¹ and R², the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; optionally R¹ and R² form a ring comprising from 3 to 8 atoms, which can bear substituents;

Q' is a moiety of the general formula (VI):

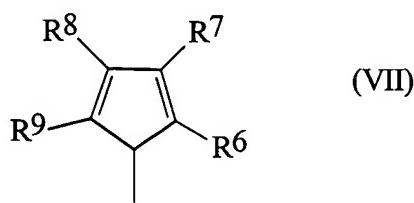


or its double bond isomers,

wherein A and B are selected from sulfur (S), oxygen (O) or CR⁵, R⁵ being selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; either A or B being different from CR⁵, and wherein the rings containing A and B have a double bond in the allowed position having an aromatic character; if A is S or O, B is CR⁵ or if B is S or O, A is CR⁵;

R³ and R⁴, the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

L' is a moiety of the general formula (VII):

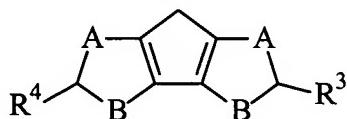


or its double bond isomers,

wherein R⁶, R⁷, R⁸ and R⁹, the same or different from each other, are selected from C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; and at least two adjacent R⁶ and R⁷ or R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents and optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

comprising the following steps:

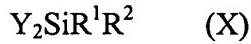
- i) treating the compound of formula (VIII) with at least one equivalent of a base selected from the group consisting of metallic sodium and potassium, sodium and potassium hydroxide and an organolithium compound;



(VIII)

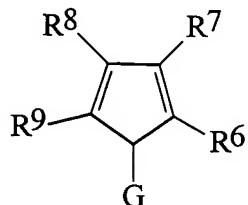
wherein the rings containing A and B have a double bond in the allowed position having an aromatic character; A, B, R³ and R⁴ are defined as in claim 1 above;

- ii) contacting the corresponding anionic compound obtained under from step i) with a compound of general formula (X):



wherein L', R¹, R² have the meaning described in claim 1 above and Y is a halogen atom selected from the group consisting of fluoride, chloride, bromide and iodide;

- iii) contacting the product obtained in step ii) with a compound of formula (XI):



(XI)

wherein R⁶, R⁷, R⁸ and R⁹ are described as in claim 1 have the meaning reported above and G is selected from sodium, potassium and or lithium[[],].

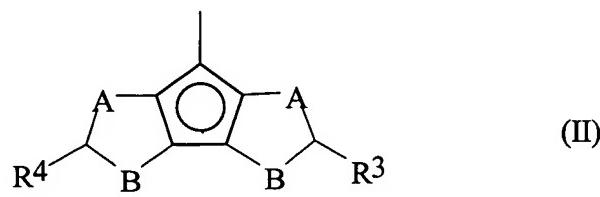
Claim 25 (currently amended) A process for the preparation of a metallocene of the general formula (I):



wherein Q, L, R¹, R², M, X and p have the meaning as defined in claim 1, SiR¹R² is a divalent group bridging the moieties L and Q;

R¹ and R², the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radical optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; optionally R¹ and R² form a ring comprising from 3 to 8 atoms, which can bear substituents;

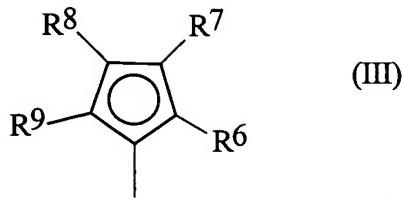
Q is a moiety of formula (II):



wherein A and B are selected from sulfur (S), oxygen (O) or CR⁵, R⁵ being selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; either A or B being different from CR⁵, and wherein the rings containing A and B have a double bond in the allowed position having an aromatic character; if A is S or O, B is CR⁵ or if B is S or O, A is CR⁵:

R³ and R⁴, the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

L is a moiety of formula (III):



wherein R⁶, R⁷, R⁸ and R⁹, the same or different from each other, are selected from C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; and at least two adjacent R⁶ and R⁷ or R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents and optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

X, the same or different from each other, is a ligand selected from hydrogen, halogen, R¹⁰, OR¹⁰, OSO₂CF₃, OCOR¹⁰, SR¹⁰, NR¹⁰₂ or PR¹⁰₂ group, wherein R¹⁰ is selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2;

comprising the following steps:

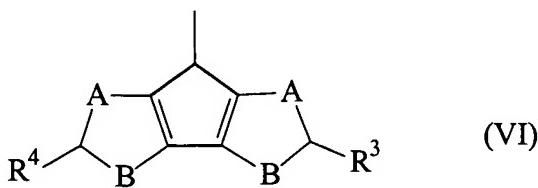
- a) contacting a ligand of formula (V):



wherein

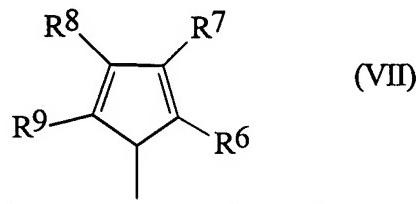
Q', L', R¹ and R² are defined as in claim 26

Q' is a moiety of the general formula (VI):



or its double bond isomers, wherein A, B, R³ and R⁴ are defined as above;

and L' is a moiety of the general formula (VII):



or its double bond isomers, wherein R⁶, R⁷, R⁸ and R⁹ are defined as above;
with a base, wherein the ratio between said base and the compound of formula (V) is at least 2,

- b) contacting the obtained product with a compound of formula MX_{p+2},
wherein M, X and p are defined as in claim 1 above.

Claims 26-29. (canceled)

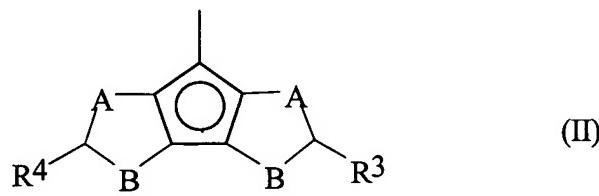
Claim 30 (currently amended) A metallocene compound of formula (I)



wherein R¹, R², L, Q, M, X and p have the meaning as in claims 1-10 SiR¹R² is a divalent group bridging the moieties L and Q;

R¹ and R², the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radical optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; optionally R¹ and R² form a ring comprising from 3 to 8 atoms, which can bear substituents;

Q is a moiety of formula (II):

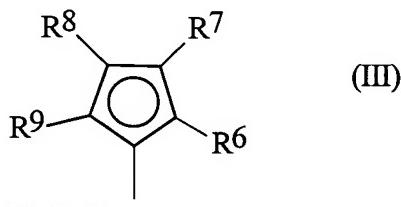


wherein A and B are selected from sulfur (S), oxygen (O) or CR⁵, R⁵ being selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; either A or B being different from CR⁵, and wherein the rings containing A and B have a double bond in the allowed position having an aromatic character; if A is S or O, B is CR⁵

or if B is S or O, A is CR⁵:

R³ and R⁴, the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

L is a moiety of formula (III):



wherein R⁶, R⁷, R⁸ and R⁹, the same or different from each other, are selected from C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; and at least two adjacent R⁶ and R⁷ or R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents and optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

X, the same or different from each other, is a ligand selected from hydrogen, halogen, R¹⁰, OR¹⁰, OSO₂CF₃, OCOR¹⁰, SR¹⁰, NR¹⁰₂ or PR¹⁰₂ group, wherein R¹⁰ is selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2.

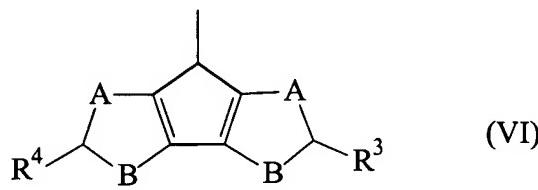
Claim 31 (currently amended) A ligand of formula (V):



wherein R¹, R², L' and Q' have the meaning as in claims 1-10 R¹ and R², the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl

radical, optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; optionally R¹ and R² form a ring comprising from 3 to 8 atoms, which can bear substituents;

Q' is a moiety of the general formula (VI):

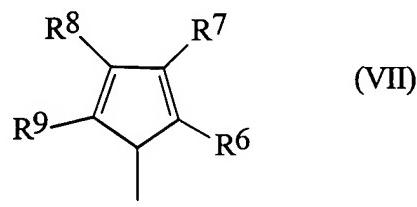


or its double bond isomers,

wherein A and B are selected from sulfur (S), oxygen (O) or CR⁵, R⁵ being selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; either A or B being different from CR⁵, and wherein the rings containing A and B have a double bond in the allowed position having an aromatic character; if A is S or O, B is CR⁵ or if B is S or O, A is CR⁵;

R³ and R⁴, the same or different from each other, are selected from hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements;

L' is a moiety of the general formula (VII):



or its double bond isomers,

wherein R⁶, R⁷, R⁸ and R⁹, the same or different from each other, are selected from C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements; and at least two adjacent R⁶ and R⁷

or R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents and optionally containing heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements.

Claim 32 (canceled)

Claim 33 (new) A copolymer of ethylene with propylene and a polyene, having a content of ethylene derived units comprised between about 50 mol% and 99 mol%, a content of propylene derived units comprised between about 1 mol% and 50 mol% and a content of a C₄-C₃₀-polyene derived units comprised between about 0 mol% and 30 mol%, and having the following characteristics:

(A) the % by mole content of propylene in the copolymer (%P) and the ratio EPE/(EPE+ PPE + PPP), wherein EPE, PPE and PPP represent the sequences ethylene/propylene/ethylene, propylene/propylene/ethylene and propylene/propylene/propylene respectively in the copolymer, satisfy the following relationship:

$$0.01\%P + EPE/(EPE+ PPE + PPP) \geq 1$$

(B) less than 1% of the CH₂ groups in the polymeric chain are sequences (CH₂)_n, wherein n is an even number.

Claim 34 (new) The copolymer according to claim 33, wherein a product of reactivity ratios r₁·r₂, wherein r₁ is the reactivity ratio of propylene and r₂ that of ethylene, is lower than 0.2.

Claim 35 (new) The copolymer according to claim 33, having an intrinsic viscosity (I.V.) > 0.5.